NJIT New Jersey's Science & Technology University

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 756: Complex Variables II
Spring 2019 Graduate Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: A deeper investigation of the theory and applications of complex analysis in several topic areas. The areas chosen for study are to be selected by the instructor from topics such as conformal mapping – including a proof of the Riemann mapping theorem, Picard's theorems, elliptic integrals, asymptotic evaluation of integrals, Riemann—Hilbert problems and complex dynamical systems.

Number of Credits: 3

Prerequisites: Math 656 or departmental approval.

Course-Section and Instructors

Course-Section	Instructor
Math 756-002	Professor D. Blackmore

Office Hours for All Math Instructors: Spring 2019 Office Hours and Emails

Required Textbooks:

Title	*Complex Variables + Notes*
Author	Ablowitz & Fokas
Edition	N/A
Publisher	Cambridge University Press
ISBN #	978-0521534291

University-wide Withdrawal Date:The last day to withdraw with a **W** is **Monday, April 8, 2019**. It will be strictly enforced.

COURSE GOALS/ EXTRA INFORMATION

Course Objectives

- Gain deep understanding of the wide-ranging properties of analytic functions of a complex variable.
- Learn key theorems applicable to analytic functions, in particular theorems concerning conformal maps and various special types of integrals.
- Learn key applications of more advanced theorems, such as those concerning asymptotic expansions of certain definite integrals.
- Learn how to apply more advanced knowledge of analytic functions to problems in fluid flow, electrostatics and other areas.

Course Outcomes

- Students gain deeper knowledge of the theory of a function of complex variable.
- Students are prepared for further study in more advanced applied mathematics courses.
- Students are better prepared for the Complex Analysis part of the Ph.D. Qualifying Examination at NJIT and other Ph.D.-granting Universities and for future research.
- Students can apply the theory of analytic functions to solve problems in applied mathematics, fluid dynamics, electrodynamics and other fields.

Course Assessment: The assessment of objectives is achieved through homework assignments, and the in-class midterm and final examinations.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework	15%
Midterm Exam	35%
Final Exam	50%

Your final letter grade will be based on the following tentative curve.

A	88 - 100	**C**	62 - 67
B+	82 - 87	**D**	55 - 61
B	75 - 81	**F**	0 - 54
C+	68 - 74		

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy. This policy will be strictly enforced.

Exams: There will be one midterm exam held in class during the semester and one comprehensive final exam. Exams are held on the following days:

Midterm Exam	March 15, 2019
Final Exam Period	May 10 - 16, 2019

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: To properly report your absence from a midterm or final exam, please review and follow the required steps under the DMS Examination Policy found here:

- http://math.njit.edu/students/policies_exam.php

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Accommodation of Disabilities: Disability Support Services (DSS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Fenster Hall, Room 260. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Disability Support Services (DSS) website at:

- http://www5.njit.edu/studentsuccess/disability-support-services/

Important Dates (See: Spring 2019 Academic Calendar, Registrar)

Date	Day	Event
January 22, 2019	T	First Day of Classes
February 1, 2019	F	Last Day to Add/Drop Classes
March 17 - 24, 2019	Su - Su	Spring Recess - No Classes, NJIT Open
April 8, 2019	M	Last Day to Withdraw
April 19, 2019	F	Good Friday - No Classes, NJIT Closed
May 7, 2019	T	Friday Classes Meet/ Last Day of Classes
May 8 & 9, 2019	W & R	Reading Days
May 10 - 16, 2019	F - R	Final Exam Period

Course Outline

Date	Sectopms	Topics	Assignment
1/22	5.1, 5.2	Conformal Maps	Selected Probs.
1/25	5.3	Conformal Maps and Inverses	Selected Probs.
1/29	Notes	Introduction to Riemann Mapping Theorem (RMT)	Selected Probs.
2/1	Notes	Normal Families, Montel's Theorem	Selected Probs.
2/5	Notes	Proof of the RMT	Selected Probs.
2/8	Notes	Continuity at Boundary	Selected Probs.
2/12	Notes	Applications: Elliptic Functions & Picard's Theorems	Selected Probs.
2/15	Notes	Elliptic functions & Picard's Theorems	Selected Probs.
2/19	6.1	Asymptotic Integration: Fundamentals	Selected Probs.
2/22	6.2	Laplace Type Integrals: Watson's Lemma; Laplace's Method	Selected Probs.
2/26	6.3	Fourier Type Integrals: Watson Analog; Stationary Phase	Selected Probs.

3/1	6.4	Steepest Descent	Selected Probs.
3/5	6.5	Applications	Selected Probs.
3/8	6.7	WKB Method	Selected Probs.
3/12	-------	**REVIEW FOR MIDTERM**	----------
3/15	-------	**MIDTERM EXAM**	----------.
3/17 - 3/24	-------	**SPRING BREAK**	----------
3/26	7.1	Riemann—Hilbert Problems	Selected Probs.
3/29	7.2	Riemann—Hilbert Problems: Cauchy Type Integrals	Selected Probs.
4/2	7.3	Scalar Riemann—Hilbert Problems	Selected Probs.
4/5	7.4	Applications of Scalar Riemann—Hilbert Problems	Selected Probs.
4/9	7.4, 7.5	Applications of Scalar Problems, Matrix Problems	Selected Probs.
4/12	7.5	Matrix Riemann—Hilbert Problems	Selected Probs.
4/16	Notes	Complex Dynamical Systems	Selected Probs.
4/19	-------	**GOOD FRIDAY**	----------
4/23	Notes	Complex Dynamical Systems	Selected Probs.
4/26	Notes	Complex Dynamical Systems	Selected Probs.
4/30	Notes	Complex Dynamical Systems	Selected Probs.
5/3	Notes	Complex Dynamical Systems	Selected Probs.
5/7	-------	**REVIEW FOR FINAL EXAM**	----------